selves for a better understanding of the alloys of metals which come within the scope of every-day experience.

From the engineer's point of view, as the report states, the most interesting information which the pyrometer has yet afforded is connected with the measurement of the internal stresses in iron and steel. The molecular change which takes place in steel must be of vital importance when the metal is subjected at high temperature to mechanical operations such as rolling or forging. "Do the molecular changes in the iron take place at one moment throughout the mass of metal? that is, is the rate of cooling approximate throughout the mass, or does the external portion of the ingot cool so much more rapidly than the centre as to allow the molecular changes in the iron, and the relation between the carbon and the iron, to become completed near the surface long before they take place in the interior of the mass?" The pyrometer used allows some insight to be gained into this hitherto unassailable problem. A small ingot of mild steel had two holes drilled into it, one near the circumference, and the other at the centre. The ingot was heated, and a thermo-junction was inserted in each hole. In this way curves of temperature were obtained simultaneously. With the mild steel the evidence as to molecular change was but slight. Another ingot of steel, containing 0·799 per cent. of carbon, 0·084 per cent. of silicon, and 0·412 per cent. of manganese, was tried in the same way. The initial temperature at the centre was 1160° C. The curve showed the molecular change at 880° C., and the carbon change at 696° C. At the circumference the carbon change took place no less than four minutes earlier than at the centre, and at the lower temperature of 665° C. This is a most important point, as the rate of cooling, as Osmond has pointed out, has a measurable effect upon the temperatures at which molecular change occurs. The great internal strain which must be set up is evident when it is borne in mind that the carbon change is accompanied by a considerable alteration of volume. It is pointed out in the report that "there can be but little question that such experiments well deserve careful attention, and, in the hands of competent observers, should be fruitful of results."

On the conclusion of the reading of the paper, the President called for a discussion, when Dr. Anderson was the first to rise. He spoke in terms of warm praise as to the value of the work done by Prof. Roberts-Austen. As an instance, he mentioned that the method described in the report, by which the temperatures of an ingot could be obtained simultaneously at the centre and the circumference, would be of the greatest use in dealing with the large pieces of steel used for gun-hoops; and he expected great help from this in the work at the Royal Arsenal.

Mr. R. Hadfield, of Sheffield, followed. He gave a summary of the effect of the most prominent alloys of iron. This table will form a useful appendix to the report when published in the Transactions of the Institution.

Prof. Howe, of Boston, gave an instance in which the Le Chatelier pyrometer had been turned to good practical account. This was in the Rodman system of gun-casting. In that process it was most desirable to know the varying temperatures of different parts of the cast, but naturally this had been hitherto impossible. By inserting a thermo-couple in the mould it was possible to get this information at all times. He thought the Le Chatelier pyrometer the greatest boon that metallurgists had received for very many years.

The next speaker was Prof. Arnold, of Sheffield, who made a certainly vigorous speech. We think, however, that he was rather carried away by his enthusiasm. To say that the work done by the author of the report was "not worth a rush," is rather straining the prerogative of rhetoric; and we failed to see, when Prof. Arnold descended to facts, that he justified the florid language of his exordium. Prof. Roberts-Austen, in his reply, gave an example of forbearance and good temper which it would be well if men of science could often follow. It was satisfactory to notice that the feeling of the meeting was by no means in accordance with Prof. Arnold.

Mr. Stromeyer added to the work done a useful table in which were collated the opinions of various authorities on the effect of alloys upon iron. The table was not read, but will be published in the Proceedings. Such work as this is very acceptable. It involves a great deal of labour and brings but small return in the way of praise and glory, which of course are two things to which a true follower of science is profoundly indifferent.

Mr. Stead, of Middlesborough, protested against Prof. Arnold's remarks, and spoke of the value of the author's work. The testimony of Mr. Stead is valuable, as he combines the position of a practical investigator, working for commercial ends, and a man of science.

The meeting broke up after passing the usual votes of thanks.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—The Junior Scientific Club held their first meeting this term in the Physiological Laboratory at the Museum, under the presidency of Mr. R. S. Gunther, of Magdalen.

Mr. W. Pullinger, of Balliol, read a paper on volatile platinum compounds, and exhibited prepared specimens.

Mr. A. F. S. Kent, of Magdalen, indicated improvements in the manipulation of photo-micrography whereby the effect of tremors was excluded, and passed through the lantern some very excellent slides which he had taken from negatives obtained by his new method.

Mr. G. E. C. Pritchard, of Hertford, exhibited specimens of Bacteria, and described the method whereby they had been obtained and prepared for microscopic exhibition.

Dr. Collier read a paper of a very interesting character on the physiology of muscular exercise with special reference to training, in the course of which he traversed some statements recently made by Sir Morell Mackenzie, to the effect that fatigue was due to the cessation of blood flowing to the muscles. Dr. Collier would rather attribute fatigue to the development of waste-products in the muscle, formed too rapidly for the blood to remove them, and quoted experiments carried out on frogs which seemed to support this view.

CAMBRIDGE.—The Agricultural Education Syndicate, in view of a grant of £400 a year from the Cambridgeshire County Council, recommend that a lecturer in agricultural science, who shall also be director of agricultural studies, should be appointed at a stipend of £500. They also propose that a second lecturer be appointed at a stipend of £300. These two lecturers would take between them the subjects of agricultural botany and agricultural chemistry.

The degree of M.A. *honoris causâ* has been conferred on the distinguished entomologist Mr. D. Sharp, F.R.S., Curator in Zoology at the University Museums.

Dr. Sir A. Geikie and Dr. T. G. Bonney have been appointed adjudicators of the Sedgwick Prize of 1895.

At St. John's College, on November 2, the following were elected to the vacant Fellowships: William McFadden Orr, B.A., Senior Wrangler, 1888; Edward Ernest Sikes, B.A., First Class (Division 1), Classical Tripos, 1889, Newton Student in Archæology; Percival Horton-Smith, B.A., First Class Natural Sciences Tripos, 1889-90 (distinguished in physiology), late Hutchinson Student in Physiology.

SOCIETIES AND ACADEMIES.

PARIS.

Academy of Sciences, October 26.—M. Duchartre in the chair.—On the theory of Hertz-oscillations, by M. H. Poincaré.—On a new mineral—boleite, by MM. Mallard and E. Cumenge. The new mineral occurs with copper in volcanic tuff and conglomerate found near Santa Rosalia, Lower California. It crystallizes in the cubic system, and its composition is represented by the expression $PbCl_2 + CuO.H_2O + \frac{1}{8}AgCl$. Its density is a little greater than that of calcite; cleavage easy parallel to the faces of cube, much less easy parallel to faces of octahedrons. Approximate index of refraction, 2·07.—Vaso-motor action of bacteria, by M. Ch. Bouchard.—Contribution to the botanical history of the truffle (fourth note): *Kama* of Bagdad (*Terfezia Hafizi* and *Terfezia metaxasi*) and of Smyrna (*Terfezia Leonis*), by M. Ad. Chatin.—On a storm observed at the Canary Islands. This is an extract from a memoir by M. de la Monneraye.—On the original causes of cyclones, and on their precursory signs: extract from a memoir by M. Le Goarant de Tromelin.—On the theory of the voltaic pile, by M. P. Duhem.—Experimental researches on a category of capillary phenomena, with an application to the analysis of alcoholic liquids and others, by M. Emile Gossart.—On bromo-

stannates, by M. Leteur. The author has prepared the following bromostannates, the general method consisting in mixing concentrated solutions of the two bromides, and evaporating the mixture in a vacuum or dry air: $SnBr_4NH_4Br$, $SnBr_4NaBr + 6H_2O$, $MgBr_2 . SnBr_4 + 10H_2O$.—On a new crystalline ferric oxychloride, by M. G. Rousseau. Concentrated solutions containing more than 80 per cent. of Fe_2Cl_6, if kept for some time at a temperature between 160° and 220° C., give rise to crystalline ferric oxychloride, $2Fe_2O_3 . Fe_2Cl_2 . 3H_2O$. The author has studied the decomposition of solutions of ferric chloride at temperatures higher than 220°. Between 225° and 280° anhydrous oxychloride ($2Fe_2O_3 . Fe_2Cl_6$) was obtained. At temperatures between 300° and 340° a new oxychloride was formed, having the composition $3Fe_2O_3 . Fe_2Cl_6$.—On the estimation of thallium, by M. H. Baubigny.—On the solution of bismuth chloride in saturated solutions of sodium chloride, and on the basic salicylate of bismuth, by M. H. Causse.—On a characteristic difference between the alcoholic radicles substituted in place of carbon and nitrogen, by M. C. Matignon. From a thermo-chemical investigation the author finds that the substitution of an alcoholic radicle for nitrogen increases the heat of combustion more than the substitution of the same radicle for carbon.—Action of benzoic acid on essence of turpentine, by MM. G. Bouchardat and J. Lafont.—On the formation of quaternary iodides of ammonium by the action of trimethylamine, in concentrated aqueous solutions, or the hydriodic ethers of several primary and one secondary alcohol, by MM. H. and A. Malbot.—On a new albuminoid substance in the blood serum of man, by M. C. Chabrié.—The soluble substances of the pyocyanic bacillus producing fever, by M. A. Charrin.—Experimental progressive muscular atrophy, by M. Roger.—Some anatomical characteristics of *Hyperoodon rostratus*, by M. E. L. Bouvier.—*Apropos* the chromatophores of Cephalopods, by M. Raphael Blanchard.—Physiology of the nerve which enables us to localize sounds, by M. Pierre Bonnier.—On a method for destroying insects injurious to the beetroot and cereals, by M. Decaux.

DIARY OF SOCIETIES.

LONDON.

THURSDAY, NOVEMBER 5.

LINNEAN SOCIETY, at 8.—A Theory of Heredity based on Force instead of Matter: Rev. Prof. Henslow.

CHEMICAL SOCIETY, at 8.—The Disociation of Liquid Nitrogen Peroxide: J. Tudor Cundall.—The Magnetic Rotation of the Ammonium and Sodium Salts of Fatty Acids: Dr. Perkin, F.R.S.—The Vapour-Pressures and Molecular Volumes of Acetic Acid and of Carbon and Tin Tetrachlorides: Prof. S. Young.—The Ortho- and Para-nitro Derivatives of Orthotoluidine: A. G. Green and T. A. Lawson.—Researches on the Gums of Arabin Group, Part II.: C. O'Sullivan, F.R.S.

CAMERA CLUB, at 8.30.—The Action of Light and Heat upon the Haloid Silver Salts: Dr. J. J. Acworth.

FRIDAY, NOVEMBER 6.

PHYSICAL SOCIETY, at 5.—On Corresponding Temperatures, Pressures, and Volumes: Prof. Sydney Young.

GEOLOGISTS ASSOCIATION, at 8.—*Conversazione.*

SATURDAY, NOVEMBER 7.

ESSEX FIELD CLUB, at 7.—Notes concerning the Distribution of Mollusca in the Thames Estuary: A. J. Jenkins.—Some Remarks upon the Aquatic Plants and Algæ of the Thames Marshes: A. J. Jenkins.—On the Occurrence of Westleton Beds in part of North-Western Essex: J. French.

SUNDAY, NOVEMBER 8

SUNDAY LECTURE SOCIETY, at 4.—The Personal Life of Shakespeare: W. E. Church.

MONDAY, NOVEMBER 9.

CAMERA CLUB, at 8.30.—Lenses, II.: Lyonel Clark.

TUESDAY, NOVEMBER 10.

MINERALOGICAL SOCIETY, at 8.—Anniversary Meeting.

INSTITUTION OF CIVIL ENGINEERS, at 8.—President's Address: George Berkley.—Presentation of Medals, Premiums, and Prizes.

PHOTOGRAPHIC SOCIETY, at 8.

WEDNESDAY, NOVEMBER 11.

GEOLOGICAL SOCIETY, at 8.—On Dacrytherium ovinum from the Isle of Wight and Quercy: R. Lydekker.—Supplementary Remarks on Glen Roy: Thos. F. Jamieson.

THURSDAY, NOVEMBER 12.

MATHEMATICAL SOCIETY, at 8.—On the Classification of Binodal Quartic Curves: H. M. Jeffery, F.R.S.—On Selective and Metallic Reflection: A. B. Basset, F.R.S.—On a Class of Automorphic Functions: Prof. W. Burnside.—The Contacts of Systems of Circles: A. Larmor.—Note on the Identity $4(x^3 - 1)(x - 1) = Y^2 \pm 27Z^2$: Prof. G. B. Mathews.—Note on Finding the G Points of a given Circle with respect to a given Triangle of Reference: J. Griffiths.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Description of the Standard Volt and Ampere Meter used at the Ferry Works, Thames Ditton: Captain H. R. Sankey (late R.E.) and F. V. Andersen.

CAMERA CLUB, at 8.30.—A New Method of Photography by Artificial Light: E. J. Humphery.

FRIDAY, NOVEMBER 13.

ROYAL ASTRONOMICAL SOCIETY, at 8.

INSTITUTION OF CIVIL ENGINEERS, at 7.30.—Description of the Works on the Barking and Pitsea Extension Railway: Henry E. Stilgoe.—Rail-Pile Bridges in Ceylon: Harry Bucknall.

CAMERA CLUB, at 8.—Retouching: Redmond Barrett.

SATURDAY, NOVEMBER 14.

ROYAL BOTANIC SOCIETY, at 3.45.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

Natural Theology: Sir G. G. Stokes (Black).—Elementary Trigonometry: J. M. Dyer and Rev. R. H. Whitcombe (Bell).—Fundamental Problems: Dr. P. Carus, 2nd edition (Chicago).—L'Amateur d'Oiseaux de Volière: H. Moreau (Paris, Baillière).—Les Coquilles Marines: A. Locard (Paris, Baillière).—Colour-Blindness and Colour-Perception: Dr. F. W. Edridge-Green (Paul).—Handleiding tot de Kennis der Flora van Nederlandsch Indië: Dr. J. G. Boerlage, Tweede Deel, Eerste Stuk (Leiden, Brill).—Star Groups: J. E. Gore (Lockwood).—Elementary Thermodynamics: J. Parker (Cambridge University Press).—Report on the Meteorology of India in 1889: J. Eliot (Calcutta).—Copernic et la Découverte du Système du Monde: C. Flammarion (Paris, Marpon and Flammarion).—Moral Teachings of Science: A. B. Buckley (Stanford).—Further Reliques of Constance Naden: edited by G. M. McCrie (Bickers).—The Wire and the Wave: J. Munro (R.T.S.).—Ytterligare om Gadolinit-Jordens Molekylarvigt: A. E. Nordenskiöld (Stockholm).—Notes on the Recent Geometry of the Triangle: J. Griffiths (Simpkin).—Journal of the Royal Microscopical Society, October (Williams and Norgate).—Illustrations of the Flora of Japan, vol. i. Nos. 7, 8, 9 (Tokyo).

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